

**APPENDIX B**

**EXPLANATION OF METHODOLOGY**

# SUMMARY OF MEASUREMENTS

## EXPLANATION OF METHODOLOGY

### 1 NII Band Worksheet

This Spreadsheet titled "N2-X Worksheet" was designed primarily to quickly collect data and provide information for all aspects of the Radio's performance. From operation in the field to how it compares with the limits specified by Regulatory Agencies worldwide. With all the possible equipment configurations and variations with respect to a specific application in the field, it was necessary to generate a tool that compiles all the information required to support modifications and design changes necessary to deliver superior performance for which it was designed. This tool should enable the "Factory Tuned Selection" process to operate smoothly. This is a SAMPLE of how the data was extrapolated the actual submittal data is located in the appendices to follow. Hopefully, it will be clear as to how the selections were determined for acceptance and Certification...

After the frequency range for the desired band has imported for the 1 MHz steps, The "Raw Readings" data is placed into the center column. The third column titled "POWER OUT", converts the reading in to milliwatts and the SLM is calculated in the bottom cell. Representative of the Peak Power Total in milliwatts.

The 26 dB bandwidth measurement is then entered in the upper right side above this table as well as the gain (dBi) for the particular antenna you wish to evaluate against the limits.

The program will allow you to take in consideration any Loss. When the loss has been calculated insert the number here and that number will be subtracted when working out the Total measurement in dB milliwatts. All measurements were taken with a 6 ft. coaxial cable with measured loss of 2.8 dB.

This is where the Peak Transmit Power (PTP) LIMIT is calculated. That LIMIT is then transferred down to the SUMMARY tables below (section 2)

N2X 5.2 GHz NII Radio		CHANNEL 1 -	
		26.48 BW(MHz) =	5.2608 GHz
		PTP Limit =	12.63
		Antenna gain (dBi) =	22.05
		Amt. gain - 5dB(dBi) =	17.5
		PTP Limit - Amt. Gain(dB) =	11.5
		Span 1 MHz	18.51
FREQUENCY		Analyzer Reading	POWER OUT
(GHz)		(dBm)	Peak (mW)
5.2508		36.83	0.000
5.2518		29.37	0.000
5.2528		34.52	0.000
5.2538		36.33	0.001
5.2548		19.80	0.013
5.2558		4.33	0.147
5.2568		1.62	0.689
5.2578		0.33	1.079
5.2588		1.33	1.350
5.2598		1.80	1.259
5.2608		2.50	1.778
5.2618		1.44	1.393
5.2628		0.83	1.211
5.2638		4.17	0.362
5.2648		2.50	0.562
5.2658		9.33	0.117
5.2668		29.83	0.008
5.2678		32.80	0.001
5.2688		36.57	0.000
5.2698		49.83	0.000
5.2708		38.80	0.000
			0.000
			16.58
Insertion Loss (dBi) =		Correction Factor =	2.600
SUMMARY		MODEL: 65 DFPS 5-52	
FLAT PANEL		Measurement	Limits
Ptotal (mW)		1.15	22.00
Ptotal (dBm)		-1.99	-0.10
ERP (dBm)		26.11	27.00
Notes: The above measurements made at the highest Output Power setting without any antenna gain. Please refer to Chart PTP-1.8 for test results for other Antenna configurations.			
(-) Below Limit			
(++) Above Limit			

Two things needs to be entered here. The 26 dB Bandwidth in MHz and the gain for the specific Antenna being investigated. It will make the adjustments to the actual calculated value, if required.

Peak Power Measurement s were taken with a Peak Power Meter for reference only.

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## Antenna Summary

With the table above, after the "raw data" has been entered in the middle column for each of the Power settings. Based on the entered 26 dB bandwidth measurement and the power level, the program will do the calculations for that particular power output and the antenna gain, and then stores the results in the far right column titled "DELTA".

This is actually a "measurement versus limit" or specification. The tables have already been configured for the applicable antenna gain in dBi. The program calculates the difference and posts the data accordingly.

The data is traceable by color as well, if a colored copy can be made available or via a colored computer monitor.

- SSP2-52A [Red] High Power Setting
- DFPS.5-52 [Blue] Low Power Setting
- DFPS1.52 [Green] Low/Medium Setting
- DFPS 2.52 [Yellow] High/Medium Setting

SUMMARY		MODEL: SSP2-52A	
PARABOLIC		Measurement	Limits
FLAT PANEL		10.58	22.01
Ptotal (mW)		7.64	-0.09
ERP (dBm)		29.74	27.00
DELTA		-11.44	7.73
		7.73	2.74

  

SUMMARY		MODEL: DFPS.5-52	
FLAT PANEL		Measurement	Limits
FLAT PANEL		5.45	22.01
Ptotal (mW)		4.76	-0.10
ERP (dBm)		32.86	27.00
DELTA		-16.55	4.87
		4.87	5.86

  

SUMMARY		MODEL: DFPS1.52	
FLAT PANEL		Measurement	Limits
FLAT PANEL		2.65	21.99
Ptotal (mW)		1.63	-0.12
ERP (dBm)		29.73	27.00
DELTA		-19.33	1.75
		1.75	2.73

  

SUMMARY		MODEL: DFPS 2.52	
FLAT PANEL		Measurement	Limits
FLAT PANEL		1.15	22.00
Ptotal (mW)		-1.99	-0.10
ERP (dBm)		26.11	27.00
DELTA		-20.85	1.89
		1.89	4.89

The last column on the right hand side of the Antenna Summary (sec 2) titled "DELTA" takes the measurement and compares the reading to the referenced specification. The values are in reference to limits. This data is transferred and stored in the next in the section where it is placed in the allocated table based on the power setting which the measurement was recorded.

# DATA COLLECTION

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## CHANNEL REFERENCE TABLES

### SWITCH SET SUMMARY

26 dB Bandwidth measurement is recorded and entered in both tables, the "N1 Worksheet" and the "SWITCH SET Summary" require that this be entered manually. This is how the "subset tables" get set up with the appropriate tracking to the allocated cells for the transfer of information.

After the "Raw Readings" are have been inserted in the "N1 worksheet" and has made the conversion to a value, in milliwatts, at the bottom of that column, place that value in the applicable cell based on the power level and the Switch setting.

Parabolic Antenna SSP2-52A				
5.3 GHz				
POWER SWITCH SET		CHANNEL 1	Reference Table	
26 dB BW/MHz	22.83	22.88	22.54	22.58
PTP Limit	22.05	22.00	21.98	22.00
Antenna Gain (dB)	28.1	28.1	28.1	28.1
Ant. Gain - 5dB(dB)	22.1	22.1	22.1	22.1
PTP Limit - Ant. Gain(dB)	-0.09	-0.10	-0.12	-0.10
ADDRESS SET		II	OO	OI
Port1 (mW)	10.58	5.45	2.85	1.35
Peak Power (dBm)	54.50	52.20	50.20	48.30
RESULTS VERSUS LIMITS - Single Antenna				
POWER SWITCH SET		SW 1	SW 2	SW 3
Port1 (mW)	-11.44	-16.55	-19.33	-20.85
Port2 (mW)	7.73	4.87	1.78	-3.89
Port3 (dBm)	2.74	5.86	2.73	-0.89
RESULTS VERSUS LIMITS - Single Antenna				
POWER SWITCH SET		SW 1	SW 2	SW 3
Port1 (mW)	-11.44	-16.55	-19.33	-20.85
Port2 (mW)	7.73	4.87	1.78	-3.89
Port3 (dBm)	2.74	5.86	2.73	-0.89

Basically, this set of calculated measurements is what is sent to the Final Data Table located in Section 6 of this document. Initially when this method was originated it was not clear as to what we were going to want to be looking at as far as the Final Data is concerned. This "test matrix" covers most of everything with the exception to the plots which are located in Appendix D.

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### Channel Data Storage

This is basically the holding area for all the Channel measurements versus frequency. Up until now, we have been referring to the data and the steps in which to import the data for a single channel. You need to move to the next channel until all the channels of interest have been entered. Then the independent channel data is stored in this table.

Compiled Results 4 ANTENNAS @ 4 POWER LEVELS				
Data ready for final Data Sheet				
Parabolic	SSP2-52A	SW 1	SW 2	SW 3
28.1 dB		-11.44	-16.55	-19.33
		7.73	4.87	1.78
		2.74	5.86	2.73
Flat Panel	DFPD2-52	SW 1	SW 2	SW 3
27.5 dB		-11.43	-16.55	-19.33
		7.53	4.27	1.15
		8.14	5.26	2.13
Flat Panel	DFPD1-52	SW 1	SW 2	SW 4
23.0 dB		-11.43	-16.55	-19.33
		2.63	0.23	-3.38
		3.84	0.76	-2.37
Flat Panel	DFPS2-52	SW 1	SW 2	SW 4
17.5 dB		-11.43	-16.55	-19.33
		-2.87	-5.73	-8.85
		-1.86	-4.74	-25.37
DATA GETS COMBINED WITH OTHER CHANNELS TESTED REVIEW FINAL RESULTS IN THE FOLLOWING TABLE				

The results are sent on their way to a spreadsheet which displays all the results where it can be seen easily the areas of concern, with reference to specifications, and those issues can be addressed at that time.

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### The Calculations Used

...time to MOVE ON TO ANOTHER CHANNEL

REFERENCE		CALCULATIONS					
LIMITS							
PTP Limit = 11dBm + 10Log(25dB BW)							
Post (mW) =	10Log(Analyzer Reading)/10						
Port (mW) =	Sum(Post mW)						
Port (dBm) =	10Log(Post mW)						
ERP (dBm) =	Port (dBm) + Ant. Gain - 6dBm						
Antenna Type(s)							
Manufacturer		Gabriel Electronics					
DESCRIPTION		Model	Low	Mid			
2' Parabolic Dish		SSP2-52	28.1	28.1			
2' Flat Panel		DFPD2-52	27.5	27.5			
1' Flat Panel		DFPD1-52	23.0	23.0			
3' Flat Panel		DFPS2-52	17.5	17.5			
GAIN (dB)			High	Mid			
Model			High	Mid			

# SUMMARY OF MEASUREMENTS

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## FINAL SUMMARY TABLE

### FINAL CALCULATED MEASUREMENTS

#### EXAMPLE

FAILING RESULTS	19.33
	1.75
	2.73
FAILING RESULTS	29.85
	3.89
	0.89

After all the measurements have been taken and the "RAW" readings have been imported into the appropriate column on the "NI Worksheet", section 1 of this document, the data has now been run through the calculations process and has been extrapolated for each of the four (4) Antennas at each of the four(4) power settings. The data now needs to be compiled and this PTP Table 1 is what we came up with.

The table is divided into three sections representing the three (3) channels investigated for this submittal. The format of the data is configured differently than in the previous tables basically to encompass the entire data package for all the channels. It is displayed from the highest power setting to the lowest, where as SW1 being the highest and SW4 being the lowest output power for Channels 1, 5 and 8. The antennas were configured in a similar fashion with the highest gain antenna at the top of each of the sections representing 1 of the 3 channels. The data has been compiled so that each antenna has its own table. Formating the results in a "antenna specific" type of arrangement. A different format then what was previously displayed but helpful to see the correlation between the various power levels and the different antenna gain(s).

Refer to Appendix C and D for the final results and the selection of the antennas, specifically being submitted for certification at this time.

#### WIRELESS, INC.

#### N2-X

#### PTP TABLE 1

##### 5.3 GHz CHANNEL 1

Parabolic	SSP2-62A	SW 1	SW 2	SW 3	SW 4
RESULTS	Initial (mW)	-11.44	-16.65	-19.33	-20.86
	Plotting	7.73	4.87	1.75	-1.89
	LIMIT	-7.96	5.95	2.73	0.99
Flat Panel	DFPD2-52	SW 1	SW 2	SW 3	SW 4
RESULTS	Initial (mW)	-11.43	-16.55	-19.33	-20.85
	Plotting	7.13	4.27	1.16	-2.49
	LIMIT	8.14	5.26	2.13	-1.49
Flat Panel	DFPD1-52	SW 1	SW 2	SW 3	SW 4
RESULTS	Initial (mW)	-11.43	-16.55	-19.33	-20.86
	Plotting	2.63	-0.23	-3.35	-2.49
	LIMIT	3.64	0.76	-2.37	-1.49
Flat Panel	DFPS-5-52	SW 1	SW 2	SW 3	SW 4
RESULTS	Initial (mW)	-11.43	-16.55	-19.33	-20.86
	Plotting	-3.87	-5.73	-8.85	-12.49
	LIMIT	-1.98	-4.74	-25.37	-28.99

##### N2-X

##### RESULTS

##### SETA

##### SW 4

##### TOTAL PASS

##### RESULTS

##### SETA

##### SW 4

##### TOTAL PASS

## **SUMMARY OF MEASUREMENTS**

## TABLES USED FOR FINAL DATA

## 5.3 "RAW" Data

## CHANNEL 1

CHANNEL 1										6.5 GHz Date: 8/25/2023	
UM/BAND	FINAL DATA					6.5 GHz Channel 1					MV, C
	EW(MHz)	12.63	12.98	12.64	12.98	EW(MHz)	0.000	48.33	0.000	49.33	
Line#	Fx (Hz)	Px (mW)	Tx (mW)	Rx (mW)	Fx (Hz)	Px (mW)	Tx (mW)	Rx (mW)	Fx (Hz)	Px (mW)	Line#
08-83	0.880	41.90	0.000	48.33	0.880	49.33	0.000	49.33	0.880	49.33	0.880
08-97	0.880	44.00	0.000	47.18	0.880	48.00	0.000	48.00	0.880	49.00	0.880
08-92	0.880	39.80	0.000	46.33	0.880	46.00	0.000	46.00	0.880	46.00	0.880
08-33	0.881	-34.83	0.000	-38.87	0.880	-35.12	0.003	-38.87	0.880	-42.33	0.880
18-60	0.815	-22.90	0.000	-22.90	0.815	-22.90	0.003	-22.90	0.815	-22.90	0.815
8-33	0.147	-11.33	0.074	-14.33	0.037	-10.00	0.000	-10.00	0.016	-10.00	0.016
1-82	0.889	-4.00	0.285	-7.00	0.178	-11.00	0.000	-11.00	0.079	-11.00	0.079
8-33	1.879	-2.00	0.062	-5.00	0.282	-4.17	0.121	-4.17	0.282	-4.17	0.121
1-33	1.288	-1.00	0.780	-4.00	0.432	-3.45	0.417	-3.45	0.432	-2.83	0.283
1-88	1.259	-1.00	0.055	-5.00	0.316	-4.83	0.141	-4.83	0.316	-4.83	0.141
2-89	1.776	-0.31	0.937	-3.47	0.430	-2.47	0.171	-2.47	0.430	-2.47	0.171
1-44	1.282	-1.02	0.056	-5.00	0.316	-4.83	0.141	-4.83	0.316	-4.83	0.141
8-83	1.111	-2.00	0.631	-5.12	0.306	-4.67	0.136	-4.67	0.306	-4.67	0.136
-0.17	0.942	-0.82	0.031	-5.03	0.281	-4.33	0.117	-4.33	0.281	-4.33	0.117
0-80	0.882	-0.33	0.293	-4.80	0.141	-10.00	0.000	-10.00	0.063	-10.00	0.063
9-33	0.117	-12.32	0.089	-18.54	0.028	-18.63	0.012	-18.63	0.028	-18.63	0.012
08-83	0.880	-34.11	0.064	-37.00	0.882	-30.63	0.061	-30.63	0.882	-30.63	0.061
08-08	0.881	-38.00	0.000	-38.00	0.880	-38.00	0.000	-38.00	0.880	-42.65	0.068
08-87	0.880	-44.87	0.069	-44.53	0.880	-47.68	0.069	-47.68	0.880	-47.68	0.069
08-83	0.880	-45.17	0.069	-46.37	0.880	-42.17	0.069	-42.17	0.880	-42.17	0.069
08-08	0.880	-48.83	0.069	-46.47	0.880	-50.03	0.069	-50.03	0.880	-50.03	0.069
IP TOTAL	-343	10.98	415.37	5.45	389.51	2.85	562	5.15			

## CHANNEL 5

## CHANNEL 8



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Title: APPENDIX B  
Subject: Eric Mansperger  
Author: Eric Mansperger  
Keywords:  
Comments:  
Creation Date: 09/07/99 12:16 PM  
Change Number: 1  
Last Saved On: 09/07/99 12:23 PM  
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